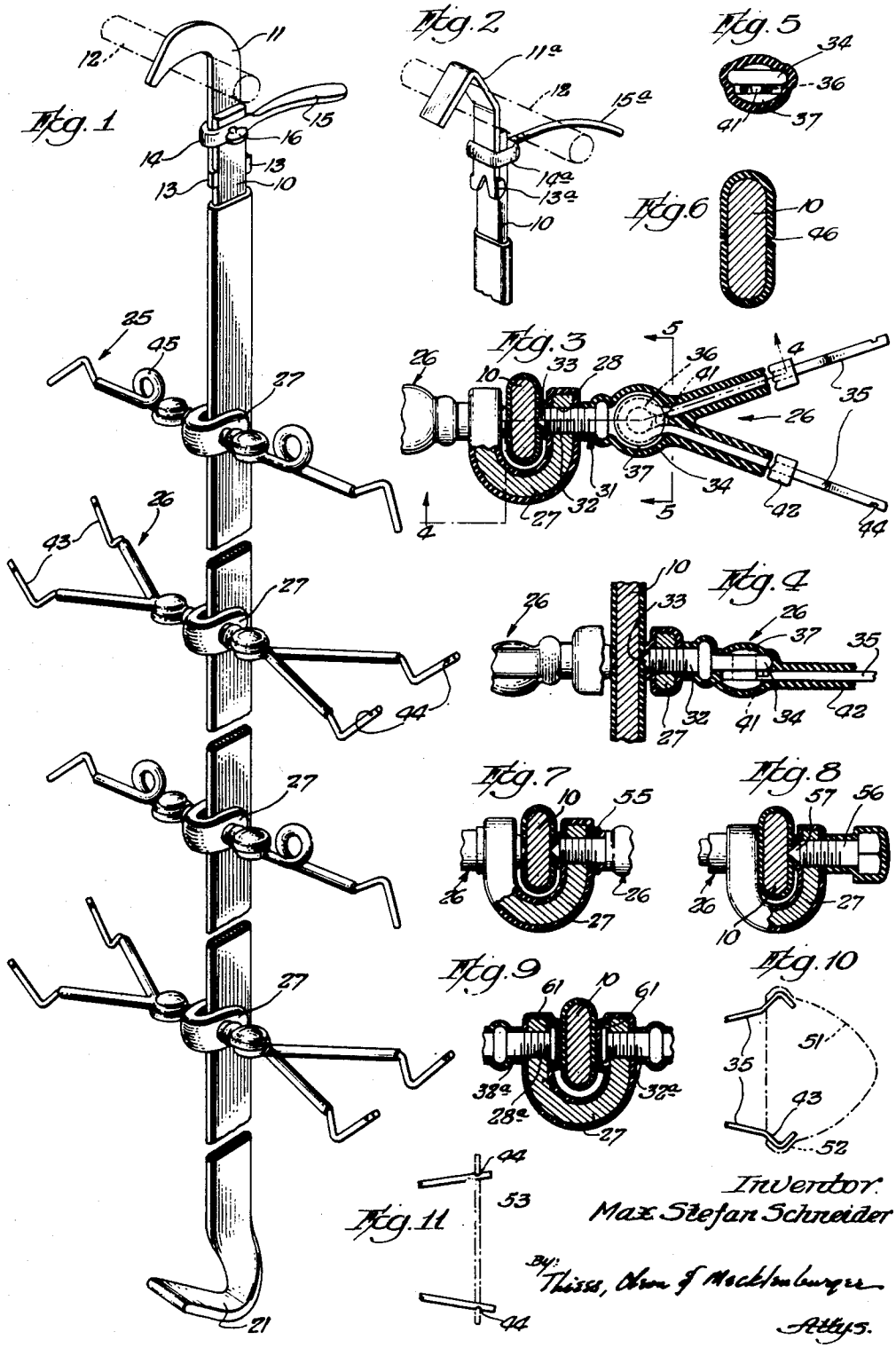
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ELECTROPLATING RACK

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Inventor:
Max Stefan Schneider

By: Thiess, Olson & Mecklenburger
Attys.

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ELECTROPLATING RACK

Max Stefan Schneider, Chicago, Ill.

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This invention relates to electroplating apparatus and more particularly to work supports or so-called plating racks for supporting in the plating bath the various articles to be plated.

Racks of the type to which the invention is applicable usually comprise an elongated bar or rod arranged to depend from the bus bar and to which are detachably secured suitable arms for supporting the articles to be plated. In order to obviate the wasteful deposit of the plating metal on the rack and its appurtenances, the same are usually coated, as by dipping, with a layer of rubber compound including synthetic or natural rubber. This rubbery coating treatment, furthermore, insures more uniform plating of the articles, since it has been found that an uncoated rack will detract from the efficiency of the plating process, particularly as to those articles supported closely adjacent the rack.

In the use of a coated rack of the type described, provision must be made whereby the detachable arms may complete a proper electrical path from the body of the rack to those portions of the arms actually in contact with the articles to be plated. In some prior devices such contact was achieved by providing studs secured to the rack body, these studs serving to carry the arms. However, this means had disadvantages in that the studs were necessarily a permanent part of the rack and therefore lacked adjustability. In addition, those studs not needed for a particular set-up had to be protected by suitable non-conductive caps, and these being relatively small, caused difficulty in handling and were easily misplaced.

My invention has for its principal object the provision of a bar-like rack body to which is secured a plurality of article-supporting arms, the arrangement being such that the arms may be secured to the body in an infinite number of vertical positions independently of one another and depending upon the size and shape of the article to be supported thereby.

Another object is to provide at least two principal types of supporting arm, one having a bifurcated article-supporting extremity, and the other a single such extremity.

Yet another object is to provide article-supporting arms so constructed as to permit the deformation of said arms into a variety of positions to accommodate numerous shapes of articles.

An additional object is to provide article-supporting arms having a recess for engaging articles having specific contours.

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Still a further object is to provide, in connection with adjustable article-supporting arms as aforesaid, a clamping means adapted not only to fix the arm to the rack body, but simultaneously to effect proper electrical contact of the arm with the body.

An additional object is to provide clamping means as aforesaid designed in such manner as to puncture the rubbery layer of the body upon attachment of the arm, but to permit substantial closure of the puncture upon removal of the arm, and thus eliminate the possibility of the plating solution entering into such contact with the metal core of the body as to deposit metal thereon.

Another object is to provide a saddle member adapted to embrace the rack body and having movable surfaces for gripping the body without the necessity of puncturing the rubbery coating of the body.

Other and further objects will appear as the description proceeds.

In carrying out my invention in one form, I provide an elongated plating rack body having a member for supporting the rack on the bus bar of the electroplating tank, and a plurality of article-supporting members extending substantially perpendicularly to the body, the members being detachably carried in saddles embracing the body. Means are provided whereby the members may be actuated to detachably clamp the saddle and hence the members in a temporarily fixed position with respect to the body. Each of the members is provided with bendable fingers, either one or a plurality thereof, a finger being so constructed and supported as to be capable of being bent to accommodate articles of different shapes.

In the drawings:

Fig. 1 is a perspective view of the rack with portions of the rack body broken out to indicate foreshortening thereof;

Fig. 2 is a perspective view of the upper portion of the rack showing an alternative rack-suspending hook;

Fig. 3 is a partial cross-sectional view taken in a plane perpendicular to the principal axis of the rack and showing one bifurcated article-supporting arm;

Fig. 4 is a partial cross-sectional view taken on the line 4—4 of Fig. 3;

Fig. 5 is a cross-sectional view taken on the line 5—5 of Fig. 3;

Fig. 6 is a cross-sectional view taken in a plane transversely of the rack body to indicate the puncturing of the rubbery coating thereof;

Fig. 7 is a view similar to Fig. 3 showing an

alternative assembly of saddle and article-supporting member;

Fig. 8 is a view similar to Fig. 3 showing another alternative form of article-supporting member;

Fig. 9 is a cross-sectional view taken on a plane perpendicularly to the rack body and showing yet another modified form of the article-supporting member;

Fig. 10 is a partial view indicating the use of the article-supporting fingers in connection with a specific shape of article; and

Fig. 11 is a view similar to Fig. 10 but showing another shape of article.

Referring first to Fig. 1, the invention is shown as embodied in a rack comprising an elongated body or core 10 of material of good electrical conductivity, e. g., copper or brass, and having a cross section which may be a flat-sided oval (Fig. 6). At its upper end the body 10 is provided with a hook member 11 adapted to suspend the complete rack on a bus bar 12 of the plating tank. The depending straight portion of the hook 11 is provided with a pair of integral bent ears 13 adapted to fit snugly over the edges of the body 10, and is also provided with a U-shaped member 14 riveted or otherwise fastened to the depending portion of the hook member 11, the cavity of the U embracing the body 10, and the free leg thereof extending beyond the body 10 to form a handle 15 whereby the entire rack and its contents may be readily manually lifted or lowered to remove or to suspend the rack from the bus bar 12. A wing screw 16 threadedly engaged with the member 14 serves to clamp the hook member 11 tightly to the body 10. By providing means engaging not only the wider faces of the body 10 but also the narrower faces, there is effected a rigid union of the member 11 with the body in two lateral, mutually perpendicular directions.

In Fig. 2 is shown an alternative form of suspension hook 11*a* similar in construction to the hook 11 except that the U-shaped member 14*a* is provided with a handle 15*a* threaded at one end in substitution of the wing screw 16. The type of hook shown in Fig. 2 is used interchangeably with that shown in Fig. 1 when it is desired to suspend the rack with the major axis of the flat, oval cross section parallel with the axis of the bus bar 12 rather than transversely thereto as illustrated in Fig. 1.

At its lower extremity the body 10 is bent into a hook portion 21 whereby the rack and its contents may be suspended in any convenient place for drainage of plating solution therefrom. Moreover, by curving the lowermost end or bight of the hook 21, the rubbery coating of the body 10, to be described hereinafter, is not as easily damaged during handling as when the rack body terminates in a blunt end.

Substantially the entire rack body 10, beginning at a point just below the ears 13, is coated with a rubber compound, generally "neoprene," a form of synthetic rubber of polymerized chloroprene, which inhibits deposit of plating metal on the rack body. Inasmuch as the coating as such forms no part of the present invention, further details thereof are deemed unnecessary.

For supporting the articles to be plated on the rack, two types of support members are provided, one to be hereinafter described for convenience as the "single finger" support 25, and the other as the "double finger" support 26. As will appear hereinafter, the supports 25 and 26 may be employed singly or in pairs, but for purposes of illustration they are in Fig. 1 shown set up in pairs.

Referring to Figs. 1 and 3, there is provided a U-shaped yoke 27 of any suitable material, for example, steel, forged or cast and adapted to embrace the boy 10 as shown. In order that the yoke may be placed in position with respect to the body 10 and removed therefrom without danger of injury to the rubber coating, the distance intermediate the legs of the yoke is made greater than the corresponding dimension of the body 10. That is to say in the case of a body of flat, oval cross section or thin, flat rectangular cross section the distance between the legs of the yoke would be greater than the thickness of the body, including of course, any rubber coating thereon. Each yoke 27 is provided with a pair of aligned threaded apertures 28, one through each leg thereof, and the entire yoke 27, except for the threads, is coated with a rubber compound similarly to the body 10.

The single finger support 25 and double finger support 26 are generally similar in construction, and a detailed description of the latter is intended to suffice as a description of the former. Each comprises a stud 31 having a threaded shank 32 terminating in a conical point 33. The head 34 of the stud 31 is substantially toroidal in form and carries the support 25 or 26. The fingers 35 of the support 26 are formed by bending a single piece of wire, preferably of circular cross section, into substantially a V-shape, the apex of the V being circular in form as shown at 36, and a rivet 37 is passed through the aperture in the portion 36 and the toroidal head 34 whereby to secure the member 26 to the stud 31. On its lower face the head 34 is provided with a button 41 (Figs. 3 and 5) adapted to enter between the fingers 35 to insure further against lateral shifting of the fingers and to serve as a locating member when assembling the fingers with the stud 31. After assembly the stud 31 and the fingers 35 are coated as indicated at 42 similarly to the coating of the body 10. However, the coating is terminated adjacent the inner end of the threaded portion 32 and short of the free ends of the fingers 35.

At their free ends the fingers 35 may be bent into V form 43 (Fig. 1), and the extremities may be notched as at 44, all for a purpose to be described. It will be obvious from what has preceded that a single finger support 25 is similar to a double finger support 26 except that one of the prongs is omitted. Furthermore, it is preferred that a single finger support 25 be formed into a single loop or a plurality of loops 45 (Fig. 1) to provide added resiliency. If desired, a similar loop or loops may be interposed in the fingers 35 of a double finger support 26. Preferably the supports 25 and 26 are made from material having good electrical conductivity and which is somewhat resilient but adapted to be bent into different forms repeatedly without danger of fracture.

In use a yoke 27 is placed over the body 10, the supports 25 or 26 being theretofore rotated on the threads 32 to withdraw the conical point 33 to a position where it will clear the rubbery coating of the body 10. After the yoke 27 is placed over the body 10, the supports 25 or 26 may be rotated on the threaded portion 32 to carry the point 33 through the rubbery coating of the body 10 until the point contacts and grips the metal core of the body 10. In this manner the assembly, including the yoke 27 and one or

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a pair of the members 25 or 26, is securely fastened at a selected elevation on the body 10. It will be understood that because of its V formation, the member 26 may be easily turned and tightened with the fingers, and by reason of the loop 45 a support 25 may be similarly rotated and tightened.

When a conical point 33 pierces the coating of the member 10, it will merely displace the somewhat resilient material while preserving a seal around the point to inhibit entrance of plating solution to the metal core of the body 10. Rotation of the threaded portion 32 will also displace the rubbery coating of the yoke 27, as clearly shown in Fig. 3, so that the protection afforded the yoke is not broken. Furthermore, the inner terminus of the coating 42 of the support 25 or 26 engages the coating of the yoke 27, as shown, so that in effect all metal parts, while being electrically and mechanically united, are thoroughly shielded from undesirable deposit of plating metal.

When it is desired to shift or to remove an assembly consisting of the yoke 27 and a support or supports 25 or 26, the threaded portion 32 is rotated in the reverse direction. While it is obvious that withdrawal of a point 33 from the coating of the body 10 will leave a minute hole 46 (Fig. 6) through the coating, its conical contour renders it substantially self-closing. Thus, even after removal of a point 33 from its engagement with the body 10, the possibility of deposit of plating metal on the body 10 through the holes 46 is virtually eliminated.

In use the supports 25 or 26 may be used in a large variety of combinations yielded not only by bending the fingers 35 but by shifting a yoke and its associated supports vertically with respect to the body 10 and with respect to each other. For example, Fig. 10 shows the V-shaped extremities 43 serving to support a hollow spun object, for example, a reflector 51 for a headlight, by engaging the rim 52 thereof. The fingers 35 may be bent apart so as to effectuate a spring-like internal gripping action on the article 51 while plating proceeds. Due to the circular cross section of the fingers 35, there is at most a line contact between the fingers and the article so that only an insignificant area of the article is blocked from the plating action. To overcome this minute blocking action, the article may, after a predetermined portion of the plating period, be re-positioned as is understood in the art. If the article to be plated is a thin washer-like part 53, as shown in Fig. 11, the notches 44 may be utilized to engage the inner periphery thereof to hold the same securely. An infinite number of combinations of supports 25 and 26 will suggest themselves to those experienced in the art, the two shown in Figs. 10 and 11 being only indicative. By way of further example, it will be apparent that the portions 43 may be used as simple hooks upon which the articles may be suspended.

From a consideration of Fig. 3 it will be obvious that one or the other of the pair of supports 26 there shown may be omitted, in which case the leg of the yoke 27 opposite the support in use will merely engage one face of the coating of the body 10, the stud 32 providing the electrical contact and gripping action.

Referring to Fig. 7, there will be noted an alternative form of the invention in which a washer 55 is interposed between the rubber coating of the support 25 or 26 and the rubber coating of the yoke 27, the washer comprising natural or synthetic rubber of some resiliency. After a support 25 or 26 has been rotated a number of times, it may be found that the area of contact between the coating thereof and of the body 10 becomes frayed or abraded so that the full benefit of the seal therebetween is lost. By introducing the rubber washer 55 to absorb this frictional wear, longer life results, the wear then being taken by the washer 55 which may be renewed from time to time at negligible expense.

In Fig. 8 there is shown another alternative form of which the yoke 27 and support 25 or 26 are fixed permanently with respect to each other in any suitable manner, and the clamping and contact of the assembly with respect to the body 10 is effected by means of a setscrew 56. The latter may be coated with rubber compound, as shown, and is provided with a conical point 57 for puncturing the coating of the body and completing the necessary electrical path.

In Fig. 9 is shown another modified form in which the conical point is omitted from the studs 32*a*, the same being otherwise as described in connection with the studs 32. The blunt end of the stud 32*a* is adapted to abut a metal plate 61 assembled loosely with respect to the stud 32*a* and yoke 27. To facilitate coating the yoke 27 and the plates 61, the latter may be made of easily magnetizable material so that when magnetized they will retain a predetermined position with respect to the steel or iron yoke 27. Accordingly, before the coating is applied, the plates 61 will be placed in position over the inner end of the threaded apertures 28*a* and the complete assembly then coated. When the coating has congealed, it serves to retain the plates 61 properly in position with respect to the studs 32*a*.

In this embodiment it will be apparent that rotation of the studs 32*a* will thrust the plates 61 toward the body 10, the respective rubber coatings of the body 10 and yoke 27 coming into contact to fix the yoke and its article supports with respect to the body. To provide the required electrical path from the body 10 to the articles to be plated, separate conductors may be used or else the embodiment of Fig. 9 may be used to carry the upper or lower supports for the articles, the remaining support being of the type shown in Figs. 3, 7, or 8, whereby an electrical path from the body 10 to the article is completed. By using this combination of supports, the number of punctured holes through the coating of the body is reduced by approximately half. A further advantage of the embodiment of Fig. 9 is that the yoke is not as easily tilted as the form of Fig. 3, there being a substantial area of clamping contact as compared to the point contact of the principal embodiment.

From the foregoing description it will be apprehended that I have provided an electroplating rack having individual article supports adapted to occupy a great variety of positions vertically of the rack body and each support being bendable to adapt the same to practically any configuration of article to be supported. There is no limitation as to the vertical position of each support as is the case with those prior art structures wherein the transverse supporting elements are fixed with respect to the body or are adapted to occupy one of a plurality of fixed positions. Thus there is unlimited flexibility in the use of the entire assembly of my invention.

Additionally, all of the parts of the rack, in-

cluding its supports, and excepting only those parts required for electrical contact, are coated with the rubber compound whereby waste of the plating metal and undesirable accumulation thereof on the rack parts is avoided. The inevitable accumulation of plating metal on the exposed free ends of the fingers **35** occupies a rather insignificant area compared to the rack as a whole, and economically the same is not considered wasteful. When this accumulation reaches a point where the terminal ends of the supports are unfit for further use, they may be replaced with another support **25** or **26**, the assembly being low in cost. A further advantage lies in the engagement of the points **33** with the body **10**, the puncturing of the coating being sufficiently minute as to render the coating substantially unmarred throughout the life of the rack. In effect such punctures only constitute pinpricks through the coating.

A further advantage lies in the use of the open-sided yoke **27** to enable one or more of the yokes to be removed without disturbing the remainder of the yokes.

Although the rack body is shown by way of example as having a flat, oval cross section, it will be obvious to those skilled in the art that other shapes may be employed, for example, round, square, or rectangular in cross section, the points **33** being adapted to engage any of these.

While I have shown particular embodiments of my invention, it will be understood, of course, that I do not wish to be limited thereto since many modifications may be made, and I, therefore, contemplate by the appended claims to cover any such modifications as fall within the true spirit and scope of my invention.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. A rack for supporting articles in an electroplating or like bath having a bus bar common to a plurality of racks comprising in combination an elongated metallic body including a portion for supporting the rack with respect to the bus bar, said body having an electrically non-conducting coating thereon coextensive with at least that portion of the rack normally immersed in the bath, a plurality of members detachably secured to the body, each said member including a U-shaped yoke embracing the body at a selected location thereon and having a threaded aperture in at least one of the legs of said yoke, an article-supporting arm carried by said yoke and having a threaded portion in engagement with said aperture, said threaded portion terminating at its free end in a point puncturing said coating thereby securing said yoke to said body and providing an electrical path from said body to said arm.

2. A rack for supporting articles in an electroplating or like bath having a bus bar common to a plurality of racks comprising in combination an elongated metallic body including a portion for supporting the rack with respect to the bus bar, said body having an electrically non-conducting coating thereon coextensive with at least that portion of the rack normally immersed in the bath, a plurality of members detachably secured to said body, each said member including a U-shaped yoke embracing the body at a selected location thereon and having a threaded opening in at least one of the legs of said yoke, a stud engaged with said yoke and including an apertured head and a threaded shank engaging said opening, said shank terminating in a point puncturing said coating thereby securing said yoke to the body and providing an electrical path from said body to said stud, and an article-supporting arm secured to said stud.

3. A rack for supporting articles in an electroplating or like bath having a bus bar common to a plurality of racks comprising in combination an elongated body including a portion for supporting the rack with respect to the bus bar, said body having an electrically non-conducting coating thereon coextensive with at least that portion of the rack normally immersed in the bath, a plurality of members detachably secured to said body, each said member including a yoke embracing the body at a selected location thereon and having a threaded opening in at least one of the legs of said yoke, a stud engaged with said yoke and including an apertured head and a threaded shank, said shank engaging said opening and said shank terminating in a point puncturing said coating to secure said yoke to said body and providing an electrical path from said body to said stud, said head having attached thereto an adjustable article-supporting arm.

MAX STEFAN SCHNEIDER.

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